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मानक

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Jawaharlal Nehru

“Step Out From the Old to the New”

IS 8872-2-4 (1979): Variable Resistors, Part 2: General Purpose, Section 4: Type VRG4P [LITD 5: Semiconductor and Other Electronic Components and Devices]



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“Knowledge is such a treasure which cannot be stolen”



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Indian Standard

## SPECIFICATION FOR VARIABLE RESISTORS

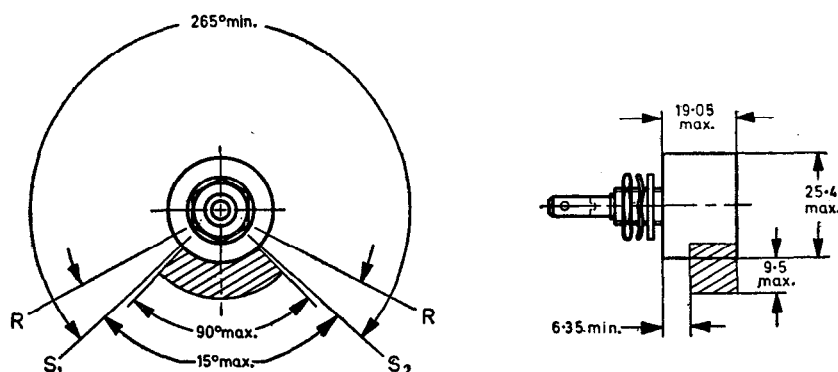
## PART II GENERAL PURPOSE

## Section 4 Type VRG4P

**0. General** — This standard shall be read in conjunction with IS : 8872 ( Part I ) - 1977 ' Specification for variable resistors: Part I General requirements and methods of tests '.

**1. Scope** — This standard covers wire-wound general purpose resistors of rotary type required for professional applications.

**2. Outline Drawing and Dimensions** — The outline drawing and dimensions of various styles shall be in accordance with Fig. 1 to 3 and Table 1.

**2.1 Style VRG4P—0.5**

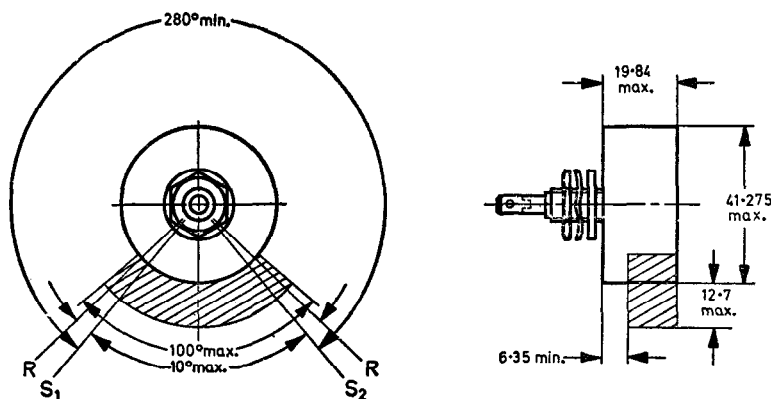
All dimensions in millimetres.

**Note 1** — The three terminations shall be within the shaded portion.

**Note 2** — The dotted line shows 15.88 mm spindle with end slot 1.4 to 1.65 mm wide, 1.4 to 1.65 mm deep.

**Note 3** — The relation between the end stop position and the effective rotation is indicated by 'S' ( end stop ) and 'R' ( rotation ).

FIG. 1 OUTLINE DRAWING AND DIMENSIONS

**2.2 Style VRG4P—1.0**

All dimensions in millimetres.

**Note 1** — The three terminations shall be within the shaded portion.

**Note 2** — The dotted line shows 15.88 mm spindle with end slot 1.4 to 1.65 mm wide, 1.4 to 1.65 mm deep.

**Note 3** — The rotation between the end stop position and the effective rotation is indicated by 'S' ( end stop ) and 'R' ( rotation ).

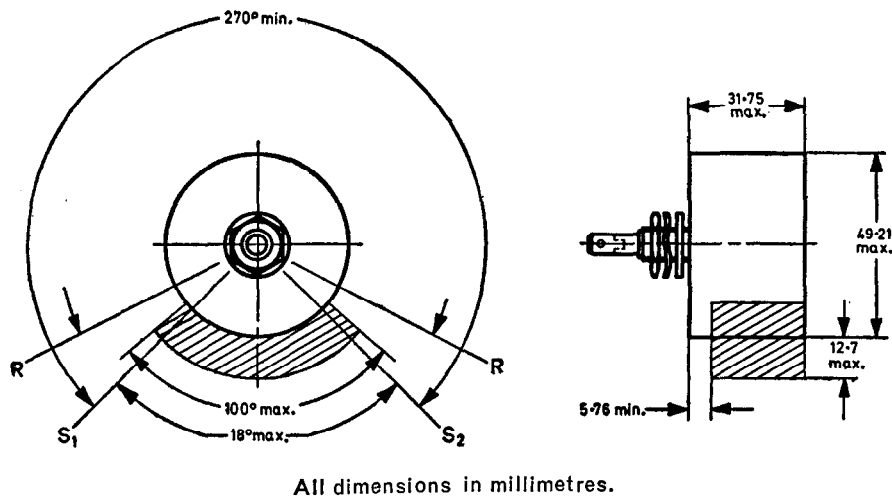
FIG. 2 OUTLINE DRAWING AND DIMENSIONS

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2.3 Style VRG4P—2·5



All dimensions in millimetres.

**Note 1** — The three terminations shall be within the shaded portion.

**Note 2** — The dotted line shows 15·88 mm spindle with end slot 1·4 to 1·65 mm wide, 1·4 to 1·65 mm deep.

**Note 3** — The rotation between the end stop position and the effective rotation is indicated by 'S' (end stop) and 'R' (rotation).

FIG. 3 OUTLINE DRAWING AND DIMENSIONS

TABLE 1 DIMENSIONS AND RATINGS  
( Clause 2 )

Style (1)	Rated Dissipa- tion at 70°C (2) W	Maximum Working Voltage (3) V	Operating Torque (4) mNm	End Stop Torque (Max) (5) Nm	Spindle Details		
					Diameter (6) mm	Length ± 0·4 (7) mm	Type (8)
VRG4P—0·5A	0·5	250	7·062 — 35·31	0·565	6·35 + 0·03 — 0·05	15·88	Screwdriver slotted
VRG4P—0·5B	0·5	250	7·0 2 — 35·31	0·565	6·35 + 0·03 — 0·05	25·4	"
VRG4P—1A	1·0	400	7·062 — 70·62	1·13	6·35 + 0·03 — 0·05	15·88	"
VRG4P—1B	1·0	400	7·062 — 70·62	1·13	6·35 + 0 03 — 0·05	25·4	"
VRG4P—2·5A	2·5	500	7·062 — 70·62	1·13	6·35 + 0·03 — 0·05	15·88	"
VRG4P—2·5B	2·5	500	7·062 — 70·62	1·13	6·35 + 0·03 — 0·05	25·4	"

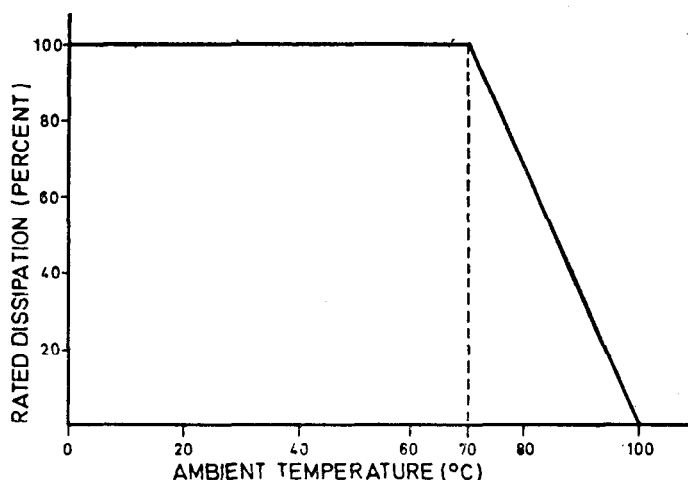
3. Ratings and Characteristics:

- |                               |   |
|-------------------------------|---|
| a) Electrical ratings         | See Table 1                               |
| b) Mechanical characteristics | See Fig. 1 to 3 and Table 1               |
| c) Selection tolerance        | ± 10 percent                              |
| d) Stability                  |   |
| i) Electrical                 | ± 2 percent                               |
| ii) Mechanical                | ± 2 percent                               |
| e) Mechanical endurance       | 20 000 cycles, 10 to 15 cycles per minute |
| f) Typical construction       | Wire-wound, spindle and panel sealed      |
| g) Resistance law             | Law A, Linear                             |

**4. IS : 589 Classification**

a) Temperature severity	40/70
b) Damp heat severity	21 days
c) Bump	4 000, 40 g
d) Vibration	10 to 2 000 Hz, 100 m/s <sup>2</sup>
e) Shock	500 m/s <sup>2</sup>
f) Acceleration	170 m/s <sup>2</sup>
g) Low air pressure	8.5 kPa
h) Rapid change of temperature	+70°C to -40°C

**5. Derating** — Variable resistors covered by this standard are derated linearly from 100 percent rated dissipation at 70°C to zero dissipation at 100°C. The dissipation at temperatures below 70°C is the rated dissipation. Reference should be made to the curve given below, to find out dissipation at other temperatures.



**6. Marking** — See 6 of IS : 8872 ( Part I ) - 1977.

**7. Material, Construction and Workmanship** — See 5 of IS : 8872 ( Part I ) - 1977.

**8. Tests****8.1 Classification of Tests**

**8.1.1 Type tests** — The procedure for type approval shall be in accordance with IS : 2612-1965 'Recommendation for type approval and sampling procedures for electronic components'. The sequence of type tests and grouping of samples for type approval shall be in accordance with Table 2.

**8.1.1.1 Number of samples** — The manufacturer shall submit for each rated dissipation, the number of samples as given below:

Highest value	16*
Middle value	16*
Lowest value	16*

**8.1.2 Routine tests** — The following tests shall be carried out on each and every variable resistor:

- Visual examination,
- Electrical continuity,
- Total resistance, and
- Sealing.

**8.1.2.1** If during routine tests, more than 10 percent of the lot fails, the entire lot may be rejected.

\*Of these 16 samples, 14 are required for carrying out type tests and 2 are to be kept as spares.

TABLE 2 TYPE TESTS

( Clause 8.1.1 )

Group	Title of Test	Number of Samples			Clause Ref in IS : 8872 (Part I)- 1977
		Highest Value	Middle Value	Lowest Value	
(1)	(2)	(3)	(4)	(5)	(6)
0	Visual examination				9.1
	Dimensions				9.1.1
	Weight				—
	Electrical continuity				8.1
	Total resistance				8.2
	Minimum effective resistance and angle of ineffective rotation				8.5
	Effective resistance and angle of effective rotation	16	16	16	8.6
	Resistance law				8.7
	Voltage proof ( one minute )				8.9
	Insulation resistance				8.10
	Operating torque				9.2
	End-stop torque				9.4
	Sealing				11.5
	Solderability				9.8.3
	Robustness of terminations				9.7
	Bump				9.10
	Vibration				9.9
	Shock	4	4	4	9.11
	Acceleration ( steady state )				9.12
	Rapid change of temperature				10.5
	Climatic				10.1
2	Damp heat ( long term )	2	2	2	10.2
3	Thrust and pull on spindle	2	2	2	9.6
4	Endurance ( mechanical )	2	2	2	11.3
	Endurance ( electrical )				11.4
5	Mould growth	1	1	1	10.4
6	Resistance to solvents	1	1	1	11.1
	Resistance to soldering heat				9.8.4
7	Salt mist	2	2	2	10.3
Spares		2	2	2	—

**8.1.3 Acceptance tests** — For the purpose of the acceptance of the lot, all the resistors shall be subjected to the tests specified in 8.1.2. Following this, two groups of samples ( Group A and B ) shall be selected and the resistors shall be subjected to the tests specified in Table 3 in the given order.

**8.2 General Conditions for Tests** — See 7 of IS : 8872 (Part I)-1977. The same measuring set shall be used for any one test but not necessarily for all tests.

**8.2.1** The test schedule with test conditions and requirements after each test, applicable to the variable resistors covered by this standard, shall be in accordance with Table 4.

TABLE 3 ACCEPTANCE TESTS

( Clause 8.1.3 )

SI No.	Test	Clause Ref in IS: 8872 ( Part I )-1977	AQL ( Percent Defective )	Inspection* Level	D/ND
(1)	(2)	(3)	(4)	(5)	(6)
1. GROUP A			1 percent	II	ND
	a) Dimensions	9.1			
	b) Resistance law	8.7			
	c) Voltage proof two seconds duration	8.9			
	d) Operating torque	9.2			
2. GROUP B					
	Sub-group B1		4 percent	S3	ND
	a) Solderability	9.8.3			
	Sub-group B2		4 percent	S3	D
	a) Resistance to soldering heat	9.8.4			
	b) Robustness of terminations	9.7			
	c) Mechanical endurance	11.3			
	d) End stop torque	9.4			
	Sub-group B3		4 percent	S3	ND
	a) Bump	9.10			
	b) Climatic	10.1			
	Sub-group B4		4 percent	S3	ND
	a) Electrical endurance ( 168 h )	11.4			

D = Destructive      ND = Non-destructive

**Note 1** — Samples subjected to destructive tests and those having failed in non-destructive tests shall not be returned to the lot.

**Note 2** — For each group/sub-group, separate samples shall be drawn.

\*Sampling plans and procedures for inspection by attributes for electronic items ( *under preparation* ).



TABLE 4 TEST SCHEDULE AND REQUIREMENTS

( Clause 8.2.1 )

SI No.	Test	Clause Ref in IS : 8872 ( Part I )-1977	Test Conditions	Requirement
(1)	(2)	(3)	(4)	(5)
<b>I) All Samples</b>				
a)	Visual examination	9.1	—	The workmanship and finish shall be satisfactory. The marking shall be legible
b)	Dimensions	9.1.1	—	The dimensions of the resistors and their terminations shall conform to values given in Table 1 and Fig. 1 to 3
c)	Weight	—	—	As in Table 1
d)	Electrical continuity	8.1	—	There shall be no electrical discontinuity
e)	Total resistance	8.2	—	The resistance value at 25°C shall correspond with the rated resistance taking into account the tolerance
f)	Minimum effective resistance and angle of ineffective rotation	8.5	—	The angle of ineffective rotation shall not exceed that specified in Fig. 1 to 3. The value of minimum effective resistance shall be not greater than 3 per cent of the total resistance
g)	Effective resistance and angle of effective rotation	8.6	—	The angle of effective rotation shall be within the limits specified in Fig. 1 to 3
h)	Resistance law	8.7	—	—
j)	Voltage proof	8.10	RMS voltage of two times the minimum working voltage shall be applied	There shall be no breakdown or flashover
k)	Insulation resistance	8.9	i) $100 \pm 15$ Vdc for resistors with working voltage of 350 V ii) $500 \pm 50$ Vdc for resistors with working voltage greater than 350 V	1 000 M $\Omega$ , Min
m)	Operating torque	9.2	—	As in Table 1
n)	End stop torque	9.4	—	As in Table 1
p)	Sealing ( applicable for spindle, panel container sealed only )	—	—	The rate of leakage for air shall not exceed 1 cm <sup>3</sup> /hour
<b>II) First Group</b>				
a)	Solderability	9.8.3	—	—
	Visual examination	9.1	—	There shall be no damage
b)	Robustness of terminations	9.7	—	—
c)	Bump	9.10	4 000, 40 g	—
	1) Visual examination	9.1	—	There shall be no damage

( Continued )

TABLE 4 TEST SCHEDULE AND REQUIREMENTS — *Contd*

SI No.	Test	Clause Ref in IS : 8872 ( Part I )-1977	Test Conditions	Requirement
(1)	(2)	(3)	(4)	(5)
	2) Electrical continuity	8.1	—	There shall be no electrical discontinuity
	3) Total resistance	8.2	—	The change in resistance value shall not exceed $\pm 2$ percent for rapid change of temperature test
d) Vibration		9.9	10-2 000 Hz, 100 m/s <sup>2</sup>	—
	1) Visual examination	9.1	—	There shall be no damage
	2) Electrical continuity	8.1	—	There shall be no electrical discontinuity
	3) Total resistance	8.2	—	The change in resistance value shall not exceed $\pm 2$ percent for rapid change of temperature test
e) Shock		9.11	—	—
	1) Visual examination	9.1	—	There shall be no damage
	2) Electrical continuity	8.1	—	There shall be no electrical discontinuity
	3) Total resistance	8.2	—	The change in resistance value shall not exceed $\pm 2$ percent for rapid change of temperature test
f) Acceleration		9.12	—	—
	1) Visual examination	9.1	—	There shall be no damage
	2) Electrical continuity	8.1	—	There shall be no electrical discontinuity
	3) Total resistance	8.2	—	The change in resistance value shall not exceed $\pm 2$ percent for rapid change of temperature test
g) Rapid change of temperature		10.5	—	—
	1) Visual examination	9.12	—	There shall be no damage
	2) Electrical continuity	8.1	—	There shall be no electrical discontinuity
	3) Total resistance	8.2	—	Change in resistance value shall not exceed $\pm 2$ percent for rapid change of temperature test
h) Climatic sequence		10.1	—	—
	1) Dry heat	10.1.2	At upper category temperature ( + 70°C )	—
	2) Damp heat ( accelerated ) first cycle	10.1.3	One cycle	—
	3) Cold	10.1.4	At minimum category temperature ( - 40°C )	—
	Visual examination	9.1	—	There shall be no damage
	4) Low air pressure	10.1.5	Degree of severity 8.5 kPa	There shall be no breakdown or flashover

( Continued )

TABLE 4 TEST SCHEDULE AND REQUIREMENTS — *Contd*

Sl No.	Test	Clause Ref in IS : 8872 ( Part I )-1977	Test Conditions	Requirement
(1)	(2)	(3)	(4)	(5)
	5) Damp heat ( accelerated ) remaining cycles	10.1.6	—	—
	i) Visual examination	9.1	—	There shall be no damage
	ii) Electrical continuity	8.1	—	There shall be no electrical discontinuity
	iii) Total resistance	8.2	—	Change in resistance value shall not exceed $\pm 2$ percent
	iv) Insulation resistance	8.10	—	10 M $\Omega$ , <i>Min</i>
	v) Operating torque	9.2	—	As in Group 0
	vi) Voltage proof	8.9	—	There shall be no breakdown or flashover
III) <i>Second Group</i>				
	a) Damp heat ( long term )	10.2	—	—
	1) Visual examination	9.1	—	There shall be no damage
	2) Electrical continuity	8.1	—	There shall be no electrical discontinuity
	3) Total resistance	8.2	—	Change in resistance value shall not exceed $\pm 2$ percent
	4) Insulation resistance	8.10	—	10 M $\Omega$ , <i>Min</i>
	5) Operating torque	9.2	—	As in Group 0
	6) Voltage proof	8.9	—	There shall be no breakdown or flashover
	7) Solderability	9.8.3	—	—
IV) <i>Third Group</i>				
	a) Thrust and pull on the spindle	9.6	—	—
	1) Visual examination	9.1	—	There shall be no damage
	b) Mechanical endurance	11.3	—	—
	1) Visual examination	9.1	—	There shall be no damage
	2) Electrical continuity	8.1	—	There shall be no electrical discontinuity
	3) Total resistance	8.2	—	Change in resistance value shall not exceed $\pm 2$ percent
	4) Resistance law	8.7	—	—
	5) Insulation resistance	8.10	—	1 000 M $\Omega$ , <i>Min</i>
	6) Operating torque	9.2	—	As in Group 0
	7) Voltage proof	8.9	—	There shall be no breakdown or flashover
	8) Sealing	11.5	—	Rate of leakage shall not exceed 1 cm <sup>3</sup> /h
V) <i>Fourth Group</i>				
	a) Electrical endurance	11.4	—	—
	1) Visual examination	9.1	—	There shall be no damage
	2) Electrical continuity	8.1	—	There shall be no electrical discontinuity

( Continued )

TABLE 4 TEST SCHEDULE AND REQUIREMENTS — *Contd*

Sl No.	Test	Clause Ref in IS : 8872 ( Part I )-1977	Test Conditions	Requirement
(1)	(2)	(3)	(4)	(5)
	3) Resistance	8.2	—	Change in resistance value shall not exceed $\pm 2$ percent
	4) Insulation resistance	8.10	—	1 000 M $\Omega$ , <i>Min</i>
	5) Voltage proof	8.9	—	There shall be no breakdown or flashover
	6) Sealing	11.5	—	Rate of leakage shall not exceed 1 cm <sup>3</sup> /h
VI) <i>Fifth Group</i>				
	a) Mould growth	10.4	—	—
VII) <i>Sixth Group</i>				
	a) Resistant to solvents	11.1	—	—
	b) Resistance to soldering heat	9.8.4	—	—
	1) Visual examination	9.1	—	There shall be no damage
	2) Total resistance	8.2	—	Change in resistance value shall not exceed $\pm 1$ percent
VIII) <i>Seventh Group</i>				
	a) Salt mist	10.3	—	—
	1) Visual examination	9.1	—	There shall be no damage
	2) Electrical continuity	8.1	—	There shall be no electrical discontinuity
	3) Total resistance	8.2	—	As in Group 0
	4) Insulation resistance	8.10	—	1 000 M $\Omega$ , <i>Min</i>
	5) Operating torque	9.2	—	As in Group 0